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THE AMPHIPOD GENUS COROPHIUM ON THE EAST COAST OF AMERICA.¹

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Up to the present time only one species of *Corophium* has been recorded from the east coast of the United States. This is *Corophium cylindricum* which was described by Thomas Say under the genus *Podocerus*. *Podocerus cylindricus* was described by Say from Egg Harbor, New Jersey, in 1818, and recent authors have considered it a species of *Corophium*, but from his description it seems to me quite unlikely that he was dealing with the genus *Corophium* at all. However, the name *C. cylindricum* has heretofore been applied to a species of *Corophium* which appears to be rather common on the New England coast. After examining the specimens in the U. S. National Museum which have been identified by different authors as *C. cylindricum*, I find that all are identical with *C. acherusicum* A. Costa, of Europe.

In studying the abundant material from the east coast of America in the collection of the National Museum, I find that five European species are represented, and that there are three species new to science. Corophium volutator (Pallas), Corophium crassicorne Bruzelius, Corophium acherusicum A. Costa, Corophium acutum Chevreux, and Corophium lacustre Vanhöffen are for the first time recorded from America. Corophium simile, Corophium tuberculatum, and Corophium louisianum are here described as new to science. The two remaining species included in this paper, Corophium rioplatense Giambiagi and Corophium pseudacherusicum Schellenberg have been previously described from America.

Corophium volutator (Pallas).

Oniscus volutator, Pallas, 1766, Miscellanea Zoologica, p. 192, pl. 14, fig. 20.
This species was described from the west coast of Norway, and has been

recorded from the northern coast of Europe and the Mediterranean.

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A single specimen was taken at Pine Point, near Portsmouth, Maine, from a duck stomach, by the U. S. Biological Survey, and it has been taken recently by the Biological Board of Canada at several places in the Bay of Fundy, where it occurs principally within the mouths of rivers.

Corophium crassicorne Bruzelius.

Corophium crassicorne, Bruzelius, 1859, Kongl. Svenska Vetenskaps-Akad. Handl. Stockholm, new ser., vol. 3, no. 1, p. 15, pl. 1, fig. 2.

Dr. K. Stephensen in 1929 gives the following distribution for this species: "... from Jan Mayen (not Greenland and Iceland) and Norway along the European coasts to Bosporus." It is now recorded for the first time from America.

It was taken by the U. S. Fish Commission in the Bay of Fundy in 1872 and later along the New England coast as far south as Gardiners Bay, Long Island. There are in the National Museum collection two female specimens taken by Dr. Wm. H. Dall at Chichagof Harbor, Attu, Alaska, June 20, 1873.

There seems to have been considerable confusion as to the status of this species until Sars published his description and figures in the "Crustacea of Norway," vol. 1, p. 615, pl. 220, in 1894. He states, however, on pages 615 and 616 that the penultimate joint of antenna 2 in the male is without any spines. This is apparently true only of the most mature males as the youngest males have the second antenna differing very slightly from that of the female, even possessing the single spine on the under margin of the fifth joint which is characteristic of the female.

Corophium acherusicum A. Costa.

Corophium acherusicum, A. Costa, 1857, Mem. Accad. Scienze, Napoli, vol. 1, p. 232.

The range of this species as given by Schellenberg in 1928 was, "Holland to Senegal and the Mediterranean; east coast of Cape Colony and from Dar es Salaam." It is now recorded from America, where it has been found from Baffins Bay to Brazil.

I have examined authentic specimens of this species from Europe and find that they differ in no characters from our east coast specimens which have been identified as *C. cylindricum* (Say). The name *C. cylindricum* would hold by right of priority except for the fact that it is not at all certain that Say was dealing with the genus *Corophium*, and even if this were certain it would be impossible to determine which species he was describing, as several are now known to occur at Egg Harbor, his type locality.

Male.—Rostrum very minute. Lower margin of first joint of antenna 1 provided distally with a small spine and proximally with one or two uneven protuberances, but in younger males this margin possesses three or four evenly spaced spines and no protuberances. The inner margin of this joint is without spines. The fourth joint of antenna 2 has the lower margin produced distally into a stout slightly curved tooth above which are two

smaller teeth; the lower inner side of this joint is without spines except in young specimens where there are several; the fifth joint is armed below proximally with a low tooth which nearly opposes the large tooth of the fourth joint when the fifth joint is flexed. First joint of mandibular palp scarcely at all produced distally where the characteristic plumose seta is borne. The dactyl of gnathopod 2 bears two teeth on inner margin. In peraeopod 5 the fifth joint has the center of the front margin somewhat protruding and above this swelling there is a row of very short straight spinules. In younger males, however, this joint does not possess these characters. Pleon segments 4-6 are completely coalesced with their united lateral margins somewhat depressed, thus making the dorsal surface slightly arched.

Female.—Rostrum small but much larger than in the male. Lower margin of first joint of antenna 1 with four or five spines, and inner margin with three proximally placed spines. Antenna 2 with lower margin of second joint bearing a lobe armed with three minute spinules; third joint bearing a pair of spines on lower margin; fourth joint bearing on lower margin a single distal spine back of which are three equally spaced pairs of spines, making seven spines in all; and fifth joint bearing two equally spaced spines on lower margin. Peraeopod 5 without the swelling or row of short spinules on fifth joint. Length of male and female from 3 to 4 mm.

Corophium pseudacherusicum Schellenberg.

Corophium pseudacherusicum, Schellenberg, 1931, Swedish Antarctic Expedition, 1901-1903, vol. II, no. 6, p. 258, fig. 134.

Corophium bonellii, Stephensen, 1924 (31), Vidensk. Meddel. fra den naturh. Forening, Kjobenhavn, Bd. 78, pp. 73-78, fig. 3 3.

Dr. A. Schellenberg described this species from four females taken in 1892 at Picton Island and Ushuaia, Tierra del Fuego, and Punta Arenas, Chile. He states that the fifth joint of antenna 2 bears two evenly spaced spines on lower margin. Dr. Schellenberg has kindly allowed me to examine one of his specimens and I find that the fifth joint bears only one spine, but after examining a great many specimens in the collection of the National Museum which I believe to belong to this species I find that this joint may bear either one or two spines, though two is the much commoner number. The fourth joint of this antenna appears always to bear on the lower margin a single distal spine back of which are two evenly spaced pairs of spines, making five in all. The third joint bears a single pair of spines, and the second joint a lobe armed with three spinules as in C. acherusicum. The first joint of antenna 1 has much the same spine arrangement as in C. a. The first joint of the mandibular palp is distally produced at the corner bearing the plumose seta as described by Dr. Schellenberg. The dactyl of gnathopod 2 bears two teeth on inner margin. Pleon segments 4-6 coalesced and together with their appendages much resembling C. a.

Male.—The rostrum is long, slender and pointed and curves slightly downward, while in the female it is short and broadly triangular. First joint of antenna 1 armed on lower margin with one terminal spine and occasionally one near the center. On the inner surface of this joint near the proximal end there is a well developed laminar protuberance which is absent in young males. Fourth joint of antenna 2 bears distally a strong, slightly curved tooth above which are one or two smaller teeth, and on the inner surface of this joint near the proximal end is a shallow depression bearing two minute spinules. First joint of mandibular palp not produced. Dactyl of gnathopod 2 bearing three teeth on inner margin. Fifth joint of peraeopod 5 without the protuberance possessed by C. a. Pleon segments 4–6 with appendages about as in female. Length of male and female about 4 mm.

I believe that most authors have mistaken this species for C. bonellii, which it superficially resembles. Sars, in "Crustacea of Norway," vol. 1, pp. 616, 617, pl. 221, fig. 1, describes and figures the female of C. bonellii, but he never saw a specimen of the male. His figure is correct and exactly corresponds with specimens of C. b. taken by the Canadian Arctic Expedition in 1913 at Grantley Harbor, Alaska. I have re-examined the single male specimen of C. b. taken on this expedition and observe the following distinguishing characters: Rostrum rather long and spear-shaped, somewhat expanded in the middle, curving slightly downward. Antenna 1 with the lower margin of first joint armed with a terminal spine and one weaker spine near center; inner margin without spines and without any protuberance such as is possessed by C. pseudacherusicum. In antenna 2 the lower distal corner of fourth joint is produced into a strong slightly curved tooth above which is a much smaller tooth, and there are no spines on inner surface of this joint; fifth joint is without even a vestige of a tooth on under surface, but the inner distal margin is produced into a lobe like that of C. pseudacherusicum. The first joint of mandibular palp is produced as in the female. The dactyl of gnathopod 2 bears only one tooth on inner margin as in the female. Pleon segments 4-6 coalesced and resembling those of C. pseudacherusicum. C. bonellii, so far as we now know, is confined to the high northern latitudes, while C. pseudacherusicum appears to have an exceedingly wide distribution. C. p. has been taken on the northern coast of Europe; British Isles; Gulf of St. Lawrence; Nova Scotia, and the east coast of America as far south as Tierra del Fuego; and there are specimens in the National Museum from San Francisco Bay, California; Oyster Bay, Washington; Alaska; and Hong Kong, China.

Corophium acutum Chevreux.

Corophium acutum, Chevreux, 1908, Bull. Soc. Zool. France, vol. 33, p. 75, fig. 6.

This is apparently a small brackish water species measuring only 3 mm. in length which was described by Ed. Chevreux from Bône, Algeria. Dr. Schellenberg, in recording this species in 1928 from Port Said, Egypt, states that the males have three spines on the lower inside margin of the fourth joint of antenna 2. I have had the privilege of examining specimens from the Lannion River, France, and I find that there are three spines on the lower inside margin of this joint.

The specimens from the east coast of America appear to agree in all particulars with the specimens from the Lannion River.

There have been only a few records of the occurrence of C. acutum. Chevreux in 1925 in "Faune de France. 9. Amphipodes," p. 367, gives the distribution as mouth of the Lannion River and Concarneau, France; Monaco; and Bône, Algeria. In 1928 Dr. Schellenberg recorded it from Port Said, Egypt. It is now recorded from America, where I have identified specimens from Long Island Sound, taken by the U.S. Fish Commission in 1874; and specimens taken by Dr. Horace G. Richards at Woods Hole, Mass., in 1929, and Cape May, New Jersey, in 1930. Dr. Waldo L. Schmitt, while traveling on the Walter Rathbone-Bacon Scholarship of the Smithsonian Institution in 1925, took several specimens of this species in the vicinity of Rio de Janeiro, Brazil.

Corophium lacustre Vanhöffen.

Corophium lacustre, Vanhöffen, 1911, Sitzungsberichte der Gesellschaft Naturforschender Freunde zu Berlin, p. 400, figs. 1-4.

This brackish water species was described by E. Vanhöffen in 1911 from the Frisches Haff. E. W. Sexton, in 1912, recorded it from the Harbor of Bremerhaven, Germany. In 1917 Vanhöffen mentions it again from the Frisches Haff and figures the female. W. Hellén records it from Borga on the Gulf of Finland in 1918. Schlienz in 1923 recorded it from the brackish waters of the Elbe. It is now recorded for the first time from America. where its range, substantiated by specimens in the U.S. National Museum, extends along the east coast of the United States, in the bays and rivers from the mouth of the Patapsco River, Chesapeake Bay, to Winyah Bay, South Carolina, in which latter place it was taken by the steamer Fish Hawk in 1891. It has been taken in the Potomac River as far as Liverpool Point, Maryland, about seventy miles from the mouth. C. lacustre is common on old piling and on old oyster shells.

This species, though superficially resembling C, acutum, attains a larger size, the mature males measuring 4.5 mm.

In 1926, Poisson and Legueux (Bull. Soc. Zool. France, vol. 51, p. 320 with figures) described, from Banyuls on the Mediterranean coast of France, what they believed to be a variety of C. acutum which they named chevreuxi. From their figures it is quite evident that they were dealing with C. lacustre Vanhöffen. They do not show the spine on the lower inner margin of the fourth joint of the second antenna of the female, but the tooth at the lower distal corner of this joint is quite characteristic of C. lacustre, whereas in C. acutum there is no vestige of a tooth on this joint in the female.

Corophium rioplatense Giambiagi.

Corophium rioplatense, Giambiagi, 1926, Ann. Museo Nacional de Historia Natural, Buenos Aires, Tome XXXIV, p. 138, figs. 1, 2, and 3.

This species was described from the La Plata River. I have not had an opportunity to examine specimens of this species, but if the figures are

correct, it appears to be quite different from any species of *Corophium* that I have seen from America, though the second antennae of the male and female are suggestive of *C. crassicorne*. The distinguishing characters appear to be: The absence of rostrum in female; the well-developed distal lobe on the lower margin of the fourth joint of the second antenna in female; the unusually narrow second joint in peraeopod 5; and the uncoalesced pleon segments. No additional records of the occurrence of this species have been published.

Corophium simile, new species.

Description of male.—Rostrum short and triangular. Eye-lobes rounding. Antenna 1 bearing two spines and many long setae on lower margin of first joint and no spines on the inner margin, first joint not as long as second and third combined, flagellum composed of five joints. Antenna 2 robust, fourth joint very strongly developed and bearing on the inner upper margin many long forward-curving setae, lower margin produced apically into a strong tooth above which is a smaller tooth which projects forward nearly as far as the larger one, and on inner side of joint near lower margin a low blunt tubercle, which is often very inconspicuous or entirely lacking, fifth joint with short blunt tooth on inner side of lower margin so placed as to oppose the larger tooth of the fourth joint. Mandibular palp with first joint slightly produced at the distal corner bearing the plumose seta, second joint longer than the first. Gnathopod 1 with palm evenly rounding, finely dentate throughout and bearing sub-marginally stout, bifurcate spines, the last of which defines the palm, dactyl overlapping palm, and bearing on inner edge a tooth and fine serrations. Gnathopod 2 with dactyl rather short and broad and bearing two teeth on inner edge. Pleon segments 4-6 coalesced, with their united lateral margins forming a ridge which is raised above the dorsal surface of the segments. Uropod 2 with rami equal in length to the peduncle. Telson forming an equilateral triangle with evenly rounding apex, dorsal surface with a triangular depression either lateral margin of which bears about four minute spinules. The entire urosome and its appendages are clothed with a fine, velvety pubescence.

Description of female.—The female bears a very close resemblance to the male, even the second antennae of the two sexes being very similar in structure, though the fourth joint in the female is proportionately shorter, and the two lower distal teeth are proportionately larger and stronger, the larger tooth reaching the middle of the flexed fifth joint, and the low tubercle on the inner side near the lower margin is even less conspicuous than in the male. In a female from Vineyard Sound, Mass., there is a slight tubercle bearing a spine at the middle of the lower margin in addition to the usual tubercle near the proximal end of the joint. The first antenna and all other appendages appear to be quite similar to those of the male. Length of male and female about 3.5 mm.

 $\label{thm:continuous} Type. \text{$-$A$ male taken by the steamer $Fish\ Hawk$ one mile inside of May River, South Carolina, January 17, 1891. Cat. No. 66786 U. S. N. M.}$

The first specimens of this species were taken by the U.S. Fish Commis-

sion from piles in Vineyard Sound, Mass., in 1871. In 1874 it was taken by the Commission at Little Peconic Bay, Long Island, and in 1875 at Woods Hole, Mass. Dr. Richard Rathbun in 1880 collected many specimens from washings of oysters in the mouth of New Haven Harbor, Conn. In 1880, 1881, 1882, and 1889 it was taken by the steamer Fish Hawk in Vineyard Sound. The Fish Hawk again took specimens in 1891 in South Carolina at the mouth of the May River; the mouth of the Kiawah River; at Port Royal; and at Skull Creek which is about half way between May River and Port Royal. This species was first taken in Chesapeake Bay by Prof. R. V. Truitt, who took several males at Great Rock, Tangier Sound, in 1925. In 1929 a specimen was taken from a sponge washed up on the beach at Ocean View, near Norfolk, Virginia, by E. A. Chapin. The most recent specimens, both males and females, were taken by me in 1931 from a sponge washed up on the beach at Grand View Beach near Fort Monroe,

The specific name simile is given in reference to the similarity in structure of the two sexes.

Corophium tuberculatum, new species.

Description of male.—Rostrum obtusely triangular. Antenna 1, first and second peduncular joints much flattened dorso-ventrally, first joint very little longer than second, flagellum composed of six or seven joints, the last of which is very small, first joint of peduncle bearing two rather small spines on lower margin and bearing many long setae on the lower, inner and outer margins of first joint, and the inner and outer margins of second and third joints. In the largest males from Chesapeake Bay and South Carolina the anterior spine on the lower margin of the first joint of antenna 1 is absent and the posterior spine is reduced in size. Antenna 2, fourth joint not excessively developed, bearing two prominent teeth on the lower distal corner and two rather low tubercles on lower margin a little toward the inner side, fifth joint with prominent tooth on lower margin about one-third the distance from the proximal end, third, fourth and fifth joints and flagellum bearing many long setae along the under side. Mandibular palp with distal corner of first joint very little produced. Gnathopod 1, palm very oblique, even convex, finely serrate and spinose throughout and defined by a single stout bifurcate spine, dactyl long and narrow, overlapping palm, and bearing on the inner margin near the middle a forward-pointing tooth, back of which are fine serrations. Dactyl of gnathopod 2 armed with two teeth and a few fine, blunt serrations on inner margin. Pleon segments 4-6 coalesced with their united edges depressed and the dorsal surface of the joints slightly convex. Uropod 2 with rami about equal in length to peduncle, inner ramus with two distal spines and one or two very slender lateral spines. Telson broader than long with distal end broadly rounding and bearing a small dorsal depression bordered on either side with three minute spinules.

Female.—The female resembles the male except in the antennae. The first joint of antenna 1 bears two spines on lower margin as in male, but the first joint is very slightly and the second not at all flattened. Antenna 2, considerably shorter than in the male, the fourth joint not very strongly developed and bearing on the lower margin a rather short distal spine and a similar one at the center, fifth joint equal in length to the fourth and without spines on lower margin. All the peduncular joints and flagellum bearing many long setae. The length of both male and female is about 4 mm.

Type.—A male taken at Mispitton Cove, Delaware Bay, Delaware, July 16, 1931, collected by Dr. Horace G. Richards. Cat. No. 66786 U. S. N. M.

The first specimen of this species, a female, was taken off Nantucket, Sept. 8, 1875, in 15 fathoms by the fisheries steamer Bluelight. In May, 1880, Dr. Richard Rathbun collected both male and female specimens in oyster washings from the mouth of New Haven Harbor, Connecticut. In August, 1880, the steamer Fish Hawk took a specimen in Narragansett Bay, Rhode Island. The Fish Hawk took a few more specimens in Vineyard Sound, Mass., in 1881 and 1882. In 1891 she again took many specimens at Skull Creek, South Carolina, and in the mouth of the May River, South Carolina. During the biological survey of Chesapeake Bay by the U.S. Bureau of Fisheries from 1915 to 1921, the Fish Hawk took hundreds of specimens in the lower part of the Bay where it appeared to be very abundant. Several immature specimens were taken by the Fish Hawk in 1915 off Bogue Inlet, North Carolina. During the summer of 1931, Dr. Horace G. Richards took several fine specimens from Barnegat Bay and the mouth of Mullica River on the east coast of New Jersey, and at the mouth of several small rivers and creeks of Delaware which empty into Delaware Bay.

The range of this species, so far as it is at present known, is the east coast of the United States from Nantucket to South Carolina.

The specific name *tuberculatum* refers to the tubercles on the lower margin of the fourth joint of the second antennae of the male.

Corophium louisianum, new species.

Description of male.—Rostrum short and triangular. Eve lobes broadly rounding. Eyes black and rather poorly defined. Antenna 1 reaching little beyond the end of the fourth joint of antenna 2, first joint with one spine near the distal end of lower margin, inner margin with a low angular protuberance near proximal end, and inside surface of joint bearing a prominent, forward-pointing, angular protuberance near proximal end, second joint about two-thirds the length of first, third joint nearly half the length of second, flagellum of eight joints, the last of which is very small. Antenna 2, second joint bearing below a prominent bilobed process which curves somewhat inward, fourth joint large and powerful, lower distal corner produced into a strong, slightly curved tooth, above which on the inside of the joint is a prominent distal lobe bearing a notch and setule, no spines or tubercles on lower margin as are present in C. similis and C. acutum, fifth joint nearly as long as fourth and without tooth or protuberance on lower margin, inside distal end broadly lobed. First joint of mandibular palp not distally produced. Gnathopod 1, sixth joint considerably expanded distally, palm convex, slightly oblique, defined by a low rounding angle and bearing bifurcate spines throughout, dactyl fitting

palm and not overlapping. Gnathopod 2, dactyl stout and strong and armed with three strong teeth on inner margin. Peraeopod 5, sixth joint shorter than second. Pleon segments 4–6 coalesced, their united lateral margins raised into a ridge above the dorsal surface. These coalesced pleon segments with their appendages very much resembling those of *C. similis*. Length about 4 mm.

Type.—A male taken in Lagoon Catherine, Chef Menteur, Louisiana, February, 1911, by Mr. W. L. McAtee. Cat. No. 67459 U. S. N. M.

The National Museum possesses another male specimen from Biloxi, Miss., which is slightly larger than the type, but which has only two teeth on the inner margin of the dactyl of the second gnathopods. The female of this species has not been observed.